Claims

[c1]   1. An apparatus for reconstructing color filter array images, comprising:

an image recording module for generating an image of sampled values output from a color filter array; each pixel in the image having a location at which a sampled value of one of a plurality of color channels is recorded; and

an image reconstruction module for linearly transforming the sampled value at the location of a selected pixel in the image to estimate a color channel not recorded by the image recording module at the location of the selected pixel in the image.

[c2]   2. The apparatus according to claim 1, wherein the image reconstruction module computes coefficients of the linear transformation.

[c3]   3. The apparatus according to claim 2, wherein image reconstruction module computes the coefficients by computing statistics that depend on the sampled value but not the position of the samples of at least two color channels within a window of the image.

[c4]   4. The apparatus according to claim 3, wherein the image reconstruction module computes the coefficients a_c and b'_c using the following equations, in which μ_c is the mean and σ_c^2 is the variance of green and red color channels C, respectively:

$$a_r = \sqrt{\frac{\sigma_G^2}{\sigma_R^2}},$$

$$a_b = \sqrt{\frac{\sigma_G^2}{\sigma_B^2}},$$

$$b'_r = \mu_G - a_r \mu_R,$$

$$b'_b = \mu_G - a_b \mu_B.$$

[c5]   5. The apparatus according to claim 2, wherein the image reconstruction module computes the coefficients by fitting a line to at least one set of sums of color channels along lines through a window of the image.

[c6]   6. The apparatus according to claim 5, wherein the set sums of color channels comprises a pair of sets of sums of color channels.

[c7]   7. The apparatus according to claim 6, wherein the image reconstruction

module fits the pair of sets of color channel sums using least squares linear regression.

[c8] 8. The apparatus according to claim 5, wherein the image reconstruction module determines one of a confidence and a variance measure for the sums of one of the columns or rows of color channels.

[c9] 9. The apparatus according to claim 5, wherein the reconstruction module computes the sums of color channels along lines of a row of the window.

[c10] 10. The apparatus according to claim 9, wherein the reconstruction module computes the sums of color channels along lines of a column of the window.

[c11] 11. A method for reconstructing color filter array images, comprising:
recording an image of sampled values output from a color filter array; each pixel in the image having a location at which a sampled value of one of a plurality of color channels is recorded; and
linearly transforming the sampled value at the location of a selected pixel in the image to estimate a color channel not recorded by the image recording module at the location of the selected pixel in the image.

[c12] 12. The method according to claim 11, further comprising computing coefficients of the linear transformation.

[c13] 13. The method according to claim 12, further comprising computing the coefficients by computing statistics that depend on the sampled value but not the position of the samples of at least two color channels within a window of the image.

[c14] 14. The method according to claim 13, further comprising computing the coefficients a_c and b'_c using the following equations, in which μ_c is the mean and σ_c^2 is the variance of green and red color channels C, respectively:

$$a_r = \sqrt{\frac{\sigma_G^2}{\sigma_R^2}},$$

$$a_b = \sqrt{\frac{\sigma_G^2}{\sigma_B^2}},$$

$$b'_r = \mu_G - a_r\mu_R,$$

$$b'_b = \mu_G - a_b\mu_B.$$

[cl5]   15. The method according to claim 12, wherein the coefficients are computed by fitting a line to at least one set of sums of color channels along lines through a window of the image.

[cl6]   16. The method according to claim 15, wherein the set sums of color channels comprises a pair of sets of sums of color channels.

[cl7]   17. The method according to claim 16, further comprising the pair of sets of color channel sums is fit using least squares linear regression.

[cl8]   18. The method according to claim 15, wherein one of a confidence and a variance measure is determined for the sums of one of the columns or rows of color channels.

[cl9]   19. The method according to claim 15, wherein the sums of color channels is computed along lines a row of the window.

[c20]   20. The method according to claim 19, wherein the sums of color channels is computed along lines a column of the window.